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What is *Scopura longa* Uéno, 1929 (Insecta, Plecoptera)? A Revision of the Genus[1]

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ABSTRACT—*Scopura prolifera* Kawai is synonymized with *S. longa* Uéno. *S. longa* sensu Kawai, 1974 is redescribed as a new species, *S. montana* Maruyama. Two new species, *S. bihamulata* Uchida and *S. quattuorhamulata* Uchida, are described from Hokkaido. One more new species, *S. laminata* Uchida, is described from Korean nymphs. These species are distinguished from one another by one or more characters: male and female genitalia, lateral margin of adult nota and epiproct of male nymph.

Scopura Uéno, 1929 [1] is the only genus of the family Scopuridae Uéno, 1935 [2], which is endemic to Japan and Korea. It comprises peculiar wingless stoneflies with many primitive morphological features [3, 4]. The first species, *S. longa* Uéno, 1929, on which the present genus was established, was described from nymphs collected by the lake Towada-ko, northern Honshu [1]. Subsequently, the first adult of *Scopura* was collected in 1930 at Takeshi-tôge, Nagano-ken, central Honshu, and described as *longa* by Uéno in the next year [5]. Then, *longa* was considered to occur in Honshu, Hokkaido and Korea [6–8]. But *longa* in this broad sense was not based on the detailed comparative studies of adults from different localities, which were seldom collected except those from central Honshu. In 1974, Kawai divided *longa* into two species by describing the second species, *S. prolifera,* from Sado Is. on the Sea of Japan [9]. He found clear differences between *prolifera* and his "*longa*" in male genitalia which were figured with a key to the species. According to his distribution map, "*longa*" occurs in most parts of Honshu but *prolifera* is restricted to Sado Is. and Ibaraki-ken, Honshu.

However, he was unable to find a nymphal character which distinguishes these two species from each other, and therefore left the nymphs from Hokkaido and Korea unidentified, where no adult had been collected. Moreover, it is uncertain if he examined the adult male from the type locality of *longa* by the lake Towada-ko, because he did not show the locality of examined specimens of his "*longa*". Accordingly, it is problematic that he assigned the adults from most parts of Honshu to *longa.*

We found an important nymphal character of *Scopura* species in the epiproct of the male nymph, and succeeded to acquire many adults from the type locality of *longa* by rearing nymphs. They are clearly assigned to *longa* by a nymphal characteristic of their epiprocts which was described and figured in the original description. Comparison of the adults from the type locality with those from Sado Is. made it clear that *S. prolifera* Kawai is a junior synonym of *S. longa* Uéno, and that the "*longa*" of Kawai [9] is an unnamed species. The

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distribution of *longa* is confined to Sado Is. and northern Honshu, whereas the unnamed species occurs only in central Honshu. We also acquired the adults from Hokkaido by rearing. They belong to two new species which are clearly distinguished from each other and from the two species of Honshu by the genitalia and the epiproct of the male nymph. The adult of Korean *Scopura* has not been collected yet. However, the epiprocts of male nymphs from south Korea indicate that they also represent a new species which is the fifth one of the genus.

Specimens used in this study are deposited in the collection of the National Science Museum, Tokyo (NSMT), the Laboratory of Entomology, Tokyo University of Agriculture (TUA), the Limnologische Flußstation des Max-Planck-Instituts für Limnologie, Schlitz (LFS) and the senior author (SU).

Localities where only nymphs were collected are not stated in detail in this paper. They will be published elsewhere with the depository of specimens.

Genus ***Scopura*** Uéno, 1929

Scopura Uéno, 1929 [1], 124. Type species: *Scopural longa* Uéno, original design. and monotypy.

Generic characters of *Scopura* were described by authors (see [10]) as the characters of *S. longa* in a broad sense. Kawai [9] distinguished the following characters (1–3) of species from the generic ones, to discriminate *prolifera* from his "*longa*":

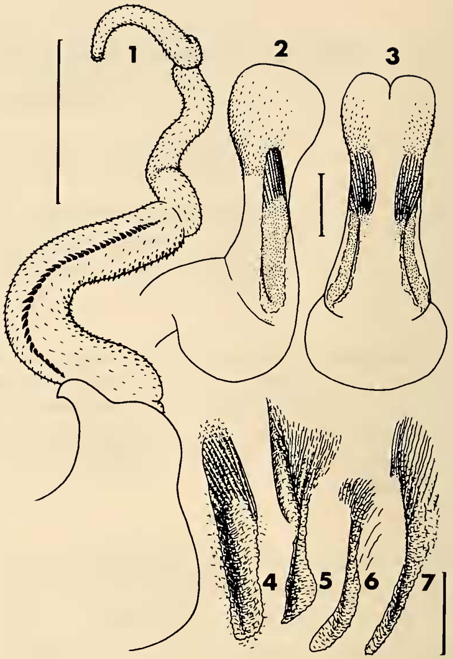
1) projection at the base of male cercus,
2) male epiproct,
3) armature of penis.

We accept his distinction of characters and add the following (4–8) to the characters of species:

4) epiproct of male nymph,
5) lateral margins of adult thoracic nota,
6) male abdominal tergum 9,
7) vagina,
8) hairs and sclerites around the opening of vagina.

We present here some generic features which have never or insufficiently been described.

Male Paraproct weakly sclerotized, simple, covered with fine spinules and curved dorsally with rounded tip. "Internal sac of epiproct" (Fig. 1, ="Epiproctblase" of Zwick [4]) eversible, armed with teeth and spinules. Basal part of the sac thick, with a pair of dorso-lateral rows of strong teeth and with ventral scattered teeth; apical part slender, gradually tapered to tip. The whole sac densely covered with small spinules. The sac has no particulars that could serve species distinction, but exhibits minor geographical variation in the number of ventral teeth. The penis (Figs. 2 and 3) consists of basal everted and apical armed (not everted) parts; the apical part with a pair of lateral sclerites (Figs. 4–7) and with fine spinules on the apical expansion around the gonopore. Apical part of the lateral sclerite with many fine longitudinal folds; but basal part without fold, concave and forming a longitudinal trough.



Figs. 1–7. Internal sac of epiproct and penis — 1, *Scopura longa* from Wainai, internal sac of epiproct, everted, lateral view; 2–3, *S. montana* sp. nov. from Mitô-san, everted penis, lateral (2) and ventral (3) views; 4–7, lateral sclerites on penes of *S. montana* sp. nov. from Mitô-san (4), *S. longa* from Wainai (5), *S. bihamulata* sp. nov. (6) and *S. quattuorhamulata* sp. nov. (7). Scales, 0.5 mm.

Female General color paler than in male. Lateral margin of pronotum (Figs. 14–19) with a hump. Vagina (Figs. 57–59, 61) with an irregularly branched accessory gland attached to the anterior part of its dorsal side. Distal end of oviduct irregularly folded, connected to apical end of vagina which bears a small sclerite ventrally; the folded part remains after KOH treatment.

Nymph The female nymph, from young (ca. 10 mm long) to mature ones, is distinguished from the male one by a central notch on abdominal sternum 8 [11]; the notch moves from the anterior margin of the sternum in young nymphs to its posterior part in mature ones. Epiproct and paraproct each with a thread of tapered gill, but the mature male nymph lacks that of the epiproct. The gills persist in adult females, but are reduced in the male.

Scopura montana Maruyama, sp. nov.

(Japanese name: Mine-towada-kawagera)
(Figs. 2, 4, 8, 9, 14, 15, 20, 24, 25, 30, 31, 36, 37, 42, 45, 54, 57, 62, 68 and 69)

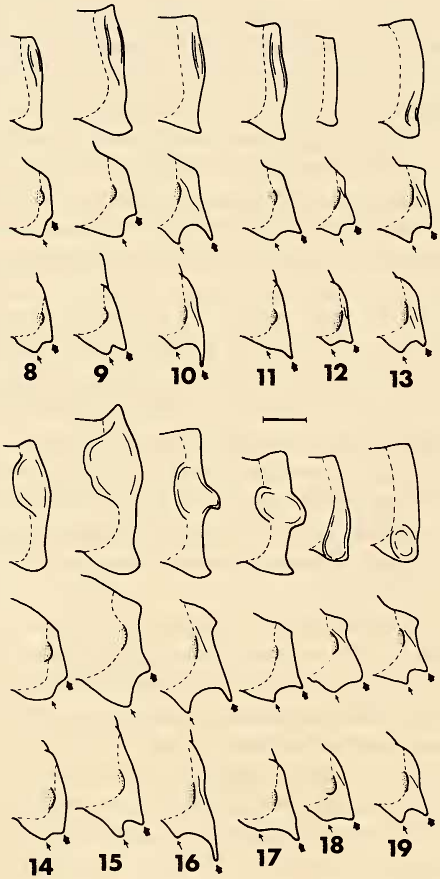
Scopura longa: Uéno, 1931 [5]: 40, fig. 3. In part (adult).
Scopura longa: Kawai, 1967 [7]: 4, 178, figs. 105–108.
Scopura longa: Zwick, 1973 [4]: 167, fig. 57.
Scopura longa: Kawai, 1974 [9]: 275, fig. 2, D–F.
Additional references: *Scopura longa,* [2, 12, 13, 14, 15, 16].

Material Types: Holotype ♂ with exuvia (NSMT), Mitô-sawa at 1270 m, Mitô-san, Hinohara-mura, Tokyo, nymph collected 1.x emerged 11–12.x.1984, S. Uchida; Paratypes, 8♂7♀ (1♂1♀, TUA; 3♂2♀, LFS; 4♂4♀, SU), same locality, 1.x.1984, nymph collected 1.x emerged 6–9.x.1984, 1.xi.1984, S. Uchida. Additional specimens: Ishikawa, Yoshinodani-mura, Chûgû, nymph collected 6.x emerged 12.xi–11.xii.1982, T. Ito and S. Uchida, 1♂3♀ (SU); Shizuoka, Honkawane-chô, Tekari-dake at 2380 m, 14.x.1980, S. Uchida and N. Morihiro, 5♂1♀ (Specimens reported by [14]: 2♂, LFS; 3♂1♀, SU); Shizuoka-shi, Tekari-dake at ca. 2400 m, 13.x.1980, N. Morihiro, 1♂ (Specimen reported by [14]; LFS) Nagano, Tobira-tôge, 11.x.1982, M. Hasegawa, 1♀ (TUA); Iiyama, 23.x.1960, collector?, 2♂1♀ (LFS); Otari-mura, Tsugaike, 10.x.1982, M. Hasegawa, 1♂ (TUA); Ômachi-shi, Nakatsuna at 950 m, nymph collected 9.viii emerged 6–18.x.1982, S. Uchida, 12♂2♀ (6♂, LFS; 6♂2♀, SU); Niigata, Itoigawa-shi, Renge-onsen, nymph collected 12.viii emerged 6–16.x.1982, S. Uchida, 1♀ (SU); Kanagawa, Tsukui-machi, Kasagi-zawa at 1290 m, 4.xi.1980, S. Uchida, 17♂3♀ (Specimens reported by [15]: 6♂1♀, LFS; 11♂2♀, SU); Tokyo, Hinohara-mura, Mitô-san, nymph collected v, ix emerged 28.ix–8.x.1981, H. Maruyama and A. Mase, nymph collected 2.v emerged ix–x. 1982, H. Maruyama, A. Mase and T. Okayama, 2♂4♀ (TUA), 25.x.1985, H. Saito, 1♀ (SU); Okutama-machi, Kawanori-yama, 30.x.1983, K. Takahashi, 1♂ (TUA); Yamanashi, Enzan-shi, Ichinose, 1.x.1984, nymph collected 1.x emerged 1–5.x.1984, 8.x.1984, nymph collected 8.x emerged 8–15.x.1984, S. Uchida, 13♂8♀ (3♂3♀, LFS; 10♂5♀, SU); Tateno-sawa at 1700 m near Syôgen-tôge, 18.xi.1985, S. Uchida, 1♂2♀ (SU); Daibosatsu-tôge, nymph collected 23.v, 29.vi emerged ix.1983, A. Mase, H. Maruyama, R. Terakoshi, C Tobiyama and M. Furukawa, 12♂9♀ (TUA); Tabayama-mura, Hiryû-san, Waru-dani at 1750 m, 22.xi.1984, S. Uchida, 1♂ (SU); Gumma, Minakami-machi, Doai, 27.x.1982, T. Torii, 1♀ (SU); Katashina-mura, Tokura, nymph collected 10.ix emerged ix-x.1982, H. Maruyama, 1♂ (TUA); Tochigi, Nikkô-shi, Hantsuki-yama, nymph collected 12.vi emerged 14–20.ix.1982, A. Mase, H. Maruyama, M. Watanabe and R. Terakoshi, 3♂1♀ (TUA); 968 nymphs (138 nymphs, TUA; 97 nymphs, LFS; 733 nymphs, SU) from Ishikawa, Shizuoka, Nagano, Niigata, Tokyo, Yamanashi, Gumma, Tochigi and Fukushima.

The name *longa* is presumed to have been applied to this species by authors [3, 17, 28, etc.] who treated the *Scopura* from central Honshu (see *longa*). But their material was not accessible for re-examination and most of these authors did not describe the characteristics of this species.

The male *longa* of Uéno [5] is assigned to this species, because he described long posterior projections on the lateral margins of meso- and metanota. Kawai [7, 9] and Zwick [4] also show clearly the characteristics of this species in their descriptions and figures of male genitalia.

Male Body 13–25 mm long. Anterior projection on lateral margin of mesonotum (thick arrows in Figs. 8 and 9) slightly shorter than posterior one (fine arrows); anterior one of metanotum (thick arrows) nearly as long as posterior one (fine arrows). Abdominal tergum 9 (Fig. 20) without spinule patch; postero-mesal part somewhat membranous. Epiproct (Figs. 42 and 45) with a pair of hooks, which project dorsally and curve anteriorly to terminate in pointed tips; the hooks are cylindrical and bear spinules on the dorsal side near the tips. Internal sac of epiproct opens dorsally between hooks; anterior side of its opening sclerotized, with spinules. Projection at the base of cercus (Figs. 24, 25, 30, 31, 36 and 37) directed dorso-mesally with a rounded tip which bears many spinules. Lateral sclerite on penis (Fig. 4) strongly sclerotized, somewhat broad and weakly folded; fine folds on its apical part directed basally to ventral side. Apical expansion of penis (Figs. 2 and 3) with spinules on dorsal and lateral side, but not on ventral side.



Figs. 8–19. Lateral margins of thoracic nota: top, pronota; middle, mesonota; below, metanota: 8–13, male; 14–19, female — 8–9, 14–15, *Scopura montana* sp. nov. from Tekari-dake (8, 14) and Mitô-san (9, 15); 10–11, 16–17, *S. longa* from Yamizo-san (10, 16) and Wainai (11, 17); 12, 18, *S. bihamulata* sp. nov.; 13, 19, *S. quattuorhamulata* sp. nov. Scale, 1 mm.

Female Body 25–35 mm long. Lateral margin of pronotum (Figs. 14 and 15) with a hump on anterior part; the hump is elongate and extends longitudinally. Projections on lateral margin of meso- and metanota (Figs. 14 and 15) similar to those in male in relative length of the anterior (thick arrows) and posterior (fine arrows) projections, but all of them are longer than those of male. Hind margin of abdominal sternum 8 (Fig. 54) shallowly concave. The membrane between vaginal opening and sternum 9 without or at most with a few hairs. Vagina (Fig. 57) large, 1.4–1.6 mm wide at its opening.

Male nymph Epiproct (Fig. 62) with a pair of sclerotized knobs dorsally; mesal part between the knobs flat and sclerotized.

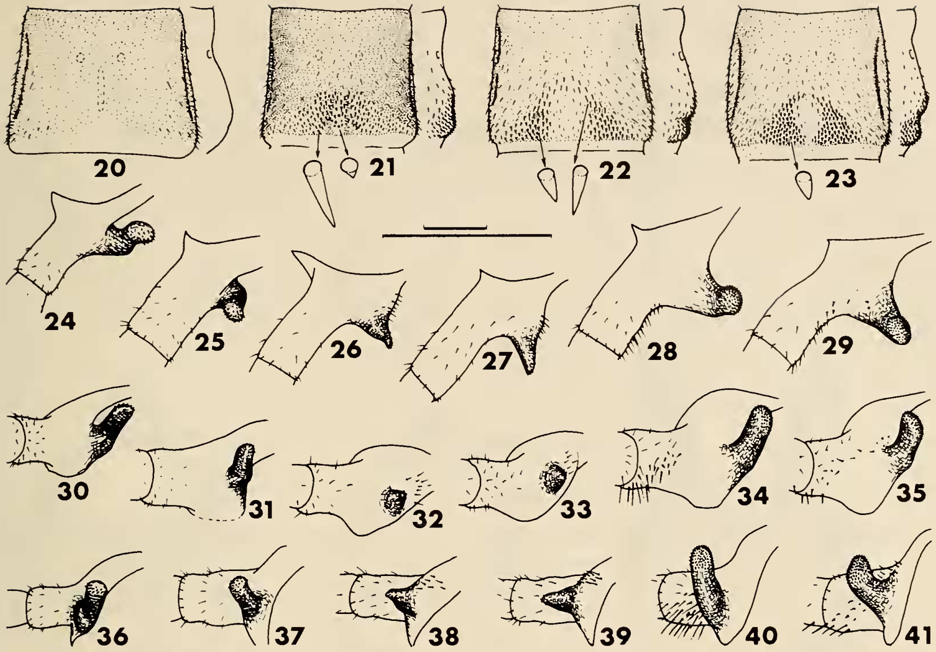
Scopura longa Uéno, 1929
(Japanese name: Towada-kawagera)
(Figs. 1, 5, 10, 11, 16, 17, 21, 26, 27, 32, 33, 38, 39, 43, 44, 46–48, 51, 55, 58, 63 and 69)

Scopura longa Uéno, 1929 [1]: 125. Holotype: a nymph, Wainai by the lake Towada-ko, Akita-ken, northern Honshu, deposited in the collection of Dr. T. Kawai (Nara).

Scopura prolifera Kawai, 1974 [9]: 275. Holotype ♂, Myôken-zan, Sado Is. on the Sea of Japan, deposited at the National Science Museum, Tokyo. Syn. nov.

Additional references: *Scopura longa,* [5], details of type locality; *S. prolifera,* [16].

Material Niigata, Sado Is., Kanai-machi, Myôken-zan, nymph collected 10–11.ix emerged 24–30.ix.1983, H. Maruyama and A. Mase, 3♂6♀ (TUA); Ibaraki, Kita-ibaraki-shi, Hanazono-san, nymph collected 6.ix emerged 4–11.x. 1982, H. Maruyama and A. Mase, 1♂3♀ (TUA); Daigo-machi, Yamizo-san, nymph collected 7–8.vi emerged 1.x–5.xi.1981, N. Gokan, T. Nagashima and H. Maruyama, nymph collected 6.ix emerged 13–27.ix.1982, H. Maruyama and A. Mase, 3♂4♀ (TUA); Akita, Kosaka-machi, Wainai by



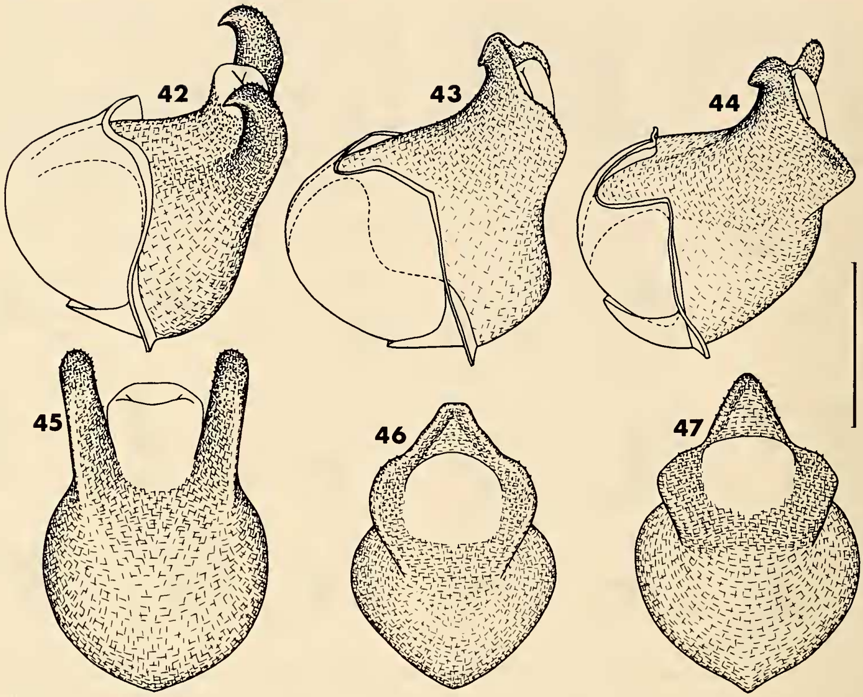
FIGS. 20–41. Male abdominal tergum 9 (20–23), dorsal views with lateral views, and the bases of cerci (24–41), dorsal views (24–29), posterior views (30–35) and inside views (36–41) — 20, 24–25, 30–31, 36–37, *Scopura montana* sp. nov. from Nakatsuna (24, 30, 36) and Mitô-san (20, 25, 31, 37); 21, 26–27, 32–33, 38–39, *S. longa* from Sado Is. (26, 32, 38) and Wainai (21, 27, 33, 39); 22, 28, 34, 40, *S. bihamulata* sp. nov.; 23, 29, 35, 41, *S. quattuorhamulata* sp. nov. Scales, 1 mm.

the lake Towada-ko, nymph collected 11.ix emerged 14.x.1982, H. Maruyama, 1♂4♀ (TUA); 21.ix.1984, nymph collected 21.ix emerged 21.ix–2.x.1984, S. Uchida, 44♂33♀ (5♂7♀, LFS; 39♂26♀, SU); 166 nymphs (63 nymphs, TUA; 32 nymphs, LFS; 71 nymphs, SU) from Niigata, Ibaraki, Fukushima, Yamagata, Iwate, Akita and Aomori.

This name was previously used for all species of the genus from Honshu, Hokkaido and Korea [8, 10]. Kawai [9] erroneously used this name for the population of central Honshu. According to our study, *longa* occurs only in Sado Is. and northern Honshu (Fig. 69). Therefore, most workers of *Scopura* have presumably applied the name *longa* to other species, mostly to *montana* from central Honshu where the genus was intensively studied.

Uéno [1] described a mesal knob on the dorsal side of the epiproct of the male nymph in detail. It is clear enough to assign this species to *longa*. Kawai [9] also showed clearly some of the characteristics of this species in his description of *prolifera*.

Male Body 18–25 mm long. Anterior projection on lateral margin of mesonotum (thick arrows in Figs. 10 and 11) longer than posterior one (fine arrows); anterior one of metanotum (thick arrows) far longer than posterior one (fine arrows). Abdominal tergum 9 (Fig. 21) with a postero-mesal patch of long spinules, but those in the central light part are short. Epiproct (Figs. 43, 44, 46–48 and 51) with a mesal sclerotized hook at dorsal tip, which curves anteriorly and forms a blunt tip; spinules scattered on dorsal side before the hook. Internal sac of epiproct opens postero-dorsally behind the hook; lateral side of its opening with a pair of sclerotized lobes, which bear spinules postero-dorsally. The lobes of the material from the type locality (Figs. 48 and 51) are less produced than those from Sado Is. (Figs. 43 and 46) and Yamizo-san (Figs. 44 and 47). Projection at the base of cercus (Figs. 26, 27, 32, 33, 38 and 39)



Figs. 42–47. Male epiprocts, dorso-lateral (42–44) and posterior (45–47) views — 42, 45, *Scopura montana* sp. nov. from Mitô-san; 43–44, 46–47, *S. longa* from Sado Is. (43, 46) and Yamizo-san (44, 47). Scale, 0.5 mm.

directed posteriorly, with a pointed (specimens from Sado Is., Figs. 26, 32 and 38) or rounded (those from the type locality, Figs. 27, 33 and 39) tip which bears some spinules; dorso-mesal side of the base of the projection with hairs. Lateral sclerite on penis (Fig. 5) strongly sclerotized, constricted in median part and strongly folded; fine folds on its apical part directed basally to dorsal side. Apical expansion of penis with spinules on all sides around the gonopore.

Female Body 23–40 mm long. Lateral margin of pronotum (Figs. 16 and 17) with a hump on median part, which is positioned transversely and is produced laterally. Projections on lateral margins of meso- and metanota (Figs. 16 and 17) similar to male in relative length of anterior (thick arrows) and posterior (fine arrows) projections, but all of them longer than those of male. Hind margin of abdominal sternum 8 (Fig. 55) deeply concave. The membrane between vaginal opening and sternum 9 with many hairs, which point anteriorly. Vagina (Fig. 58) smaller than in *montana,* 1.2–1.3 mm wide at its opening.

Male nymph Epiproct (Fig. 63) with a mesal sclerotized knob dorsally; both sides of the knob also sclerotized, rounded, but never produced to knobs nor swellings as in *montana, bihamulata* and *laminata.*

Scopura bihamulata Uchida, sp. nov.

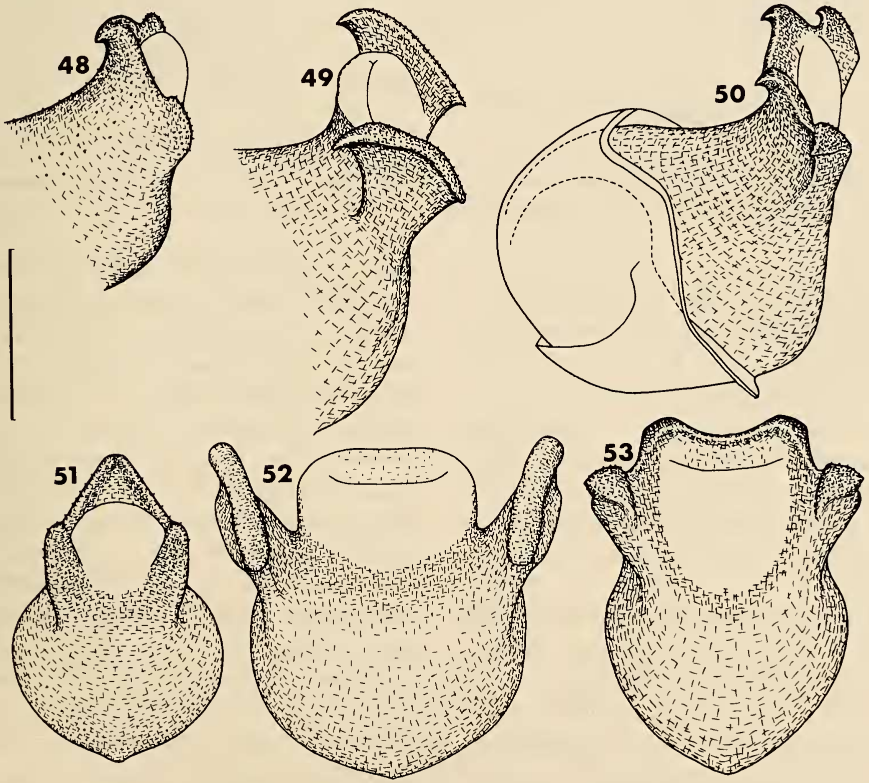
(Japanese name: Futakagi-towada-kawagera)
(Figs. 6, 12, 18, 22, 28, 34, 40, 49, 52, 56, 59, 64 and 69)

Material Types: Holotype ♂ with exuvia (NSMT), Asari-tôge, 600 m, Otaru-shi, Hokkaido, nymph collected 18.vii emerged 17–23.ix. 1984, S. Uchida; Paratype, ♀, same locality, nymph collected 18.vii.1984 emerged 2–8.x.1985, S. Uchida (SU). Additional specimens: 45 nymphs (32 nymphs, LFS; 13 nymphs, SU) from Sapporo-shi and Otaru-shi, Hokkaido.

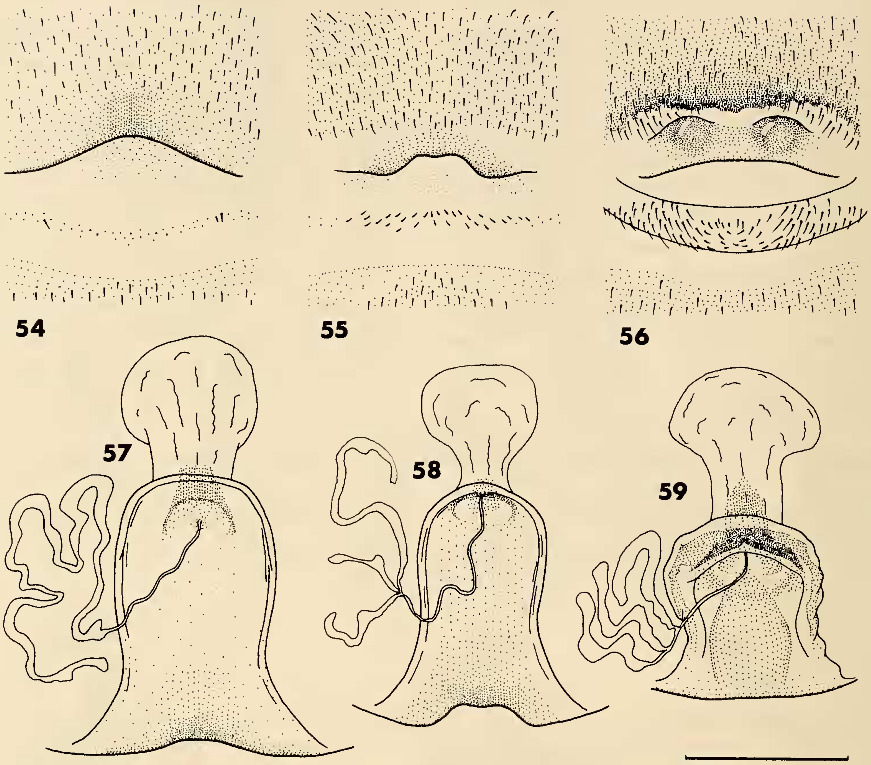
Male Body 22 mm long. Lateral projections on thoracic nota (Fig. 12) poorly developed; anterior ones of meso- and metanota (thick arrows) longer than those of *montana* and *quattuorhamulata* but shorter than those of *longa,* in relation to the posterior ones (fine arrows). Abdominal tergum 9 (Fig. 22) with a pair of spinule patches posteriorly; the posterior spinules shorter than the anterior ones. Epiproct (Figs. 49 and 52) with a pair of strong hooks, which are spread like fans. Dorsal margin of the hook forming an elongate disk with spinules; the disk extends anteriorly to a pointed tip. Internal sac of epiproct opens dorsally between the hooks; anterior side of its opening sclerotized without spinules. Projection at the base of cercus (Figs. 28, 34 and 40) directed dorso-mesally, with a rounded tip which bears dense spinules. Lateral sclerite on penis (Fig. 6) weakly sclerotized, slender and weakly folded; fine folds on its apical part directed basally to dorsal side. Apical expansion of penis with spinules on all sides around the gonopore.

Female Body 22 mm long. Lateral margin of pronotum (Fig. 18) with a hump on posterior part, which is longitudinally elongate. Projections on lateral margins of meso- and metanota (Fig. 18) similar to those of *longa,* but less pointed. Hind margin of abdominal sternum 8 (Fig. 56) not concave, with a pair of sclerotized humps. The membrane between vaginal opening and sternum 9 with two lip-like folds; the anterior one without hairs, but the posterior one with many hairs; the mesal hairs shorter than the lateral ones. Vagina (Fig. 59) short but as wide as in *longa,* 1.2 mm wide at its opening, with a dorsal sclerite which tapers anteriorly.

Male nymph Epiproct (Fig. 64) with a pair of dorso-lateral sclerotized swellings which are produced dorsally; the swellings far larger than the knobs of *montana.*



FIGS. 48–53. Male epiprocts, dorso-lateral (48–50) and posterior (51–53) views — 48, 51, *Scopura longa* from Wainai; 49, 52, *S. bihamulata* sp. nov.; 50, 53, *S. quattuorhamulata* sp. nov. Scale, 0.5 mm.



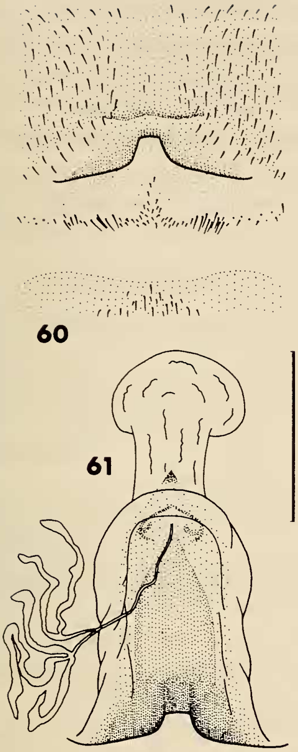
Figs. 54–59. Female abdominal sterna 8 and 9 (54–56) and vagina (57–59) — 54, 57, *Scopura montana* sp. nov. from Mitô-san; 55, 58, *S. longa* from Wainai; 56, 59, *Scopura bihamulata* sp. nov. Scale, 1 mm.

Scopura quattuorhamulata Uchida, sp. nov.
(Japanese name: Yotsukagi-towada-kawagera)
(Figs. 7, 13, 19, 23, 29, 35, 41, 50,
53, 60, 61, 65 and 69)

Material Types: Holotype ♂ with exuvia (NSMT), small stream into Niikappu-ko, 450 m, 1.5 km WNW of Niikappu-dam, Niikappu-chô, Hokkaido, nymph collected 19.ix emerged 19–20. ix.1984, S. Uchida and R. Kuranishi; Paratypes, 6♂10♀ (1♂1♀, TUA; 2♂4♀, LFS; 3♂5♀, SU), same data. Additional specimens: 48 nymphs (21 nymphs, LFS; 27 nymphs, SU) from Otoineppu-mura and Niikappu-chô, Hokkaido.

Male Body 18–25 mm long. Anterior projections on lateral margins of meso- and metanota (thick arrows in Fig. 13) longer than those of *montana* but shorter than those of *longa* and *bihamulata*, in relation to the posterior ones (fine arrows). Abdominal tergum 9 (Fig. 23) with a pair of spinule patches posteriorly; the spinules uniformly short excepting some long ones at the anterior end of the patch. Epiproct (Figs. 50 and 53) with four small hooks; a mesal pair before the opening of the internal sac, another lateral pair on its lateral sides. The mesal hooks curve anteriorly whereas the lateral ones curve antero-laterally; all tips of the hooks pointed. Projection at the base of cercus (Figs. 29, 35 and 41) directed dorsally, mesally and posteriorly, with a rounded tip which bears dense spinules. Lateral sclerite on penis (Fig. 7) strongly sclerotized, slender but broad in apical part, moderately folded; fine folds on its apical part directed basally to dorsal side. Apical expansion of penis with spinules on all sides around the gonopore.

Female Body 22–30 mm long. Lateral margin of pronotum (Fig. 19) with a hump on posterior



Figs. 60–61. Female abdominal sterna 8 and 9 (60) and vagina (61) of *S. quattuorhamulata* sp. nov. Scale, 1 mm.

end, which is oval with the longitudinal axis. Projections on lateral margins of meso- and metanota (Fig. 19) similar to those of *montana*, but anterior projections (thick arrows) slightly longer in relation to posterior ones (fine arrows). Hind margin of abdominal sternum 8 (Fig. 60) more deeply concave than in *longa*. The membrane between vaginal opening and sternum 9 with many hairs; the mesal hairs shorter than the lateral ones. Vagina (Fing. 61) nearly as large as in *longa*, 1.2 mm wide at its opening, with a dorsal sclerite which tapers anteriorly.

Male nymph Epiproct (Fig. 65) without knob nor swelling, smoothly rounded and sclerotized dorso-laterally.

Scopura laminata Uchida, sp. nov.
(Figs. 66, 67 and 69)

Material Types: Holotype, a male nymph (NSMT), small stream beside the temple Pukdaesa, ca. 1200 m, Odae-san, Kangwon-do, Korea, 10.vi.1983, S. Uchida; Paratypes, 9 male nymphs (1 nymph, TUA; 4 nymphs, LFS; 4 nymphs, SU), same data. Additional specimens: 74 nymphs (14 nymphs, LFS; 60 nymphs, SU) from Chiri-san, Kyŏngsangnam-do and the type locality, Korea.

Adult Unknown.

Male nymph Epiproct (Figs. 66 and 67) with a pair of lateral membranous swellings which are produced posteriorly and with a dorso-mesal sclerite which is produced dorsally with a transversely elongated small concavity at its center. The swellings of the specimens from Chiri-san (Fig. 66) are smaller than those from the type locality (Fig. 67)

KEYS TO THE SPECIES OF *SCOPURA*

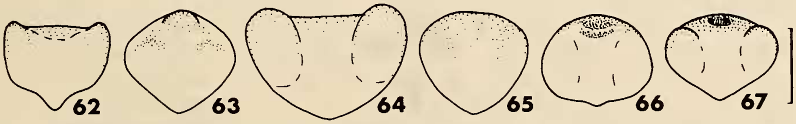
The adult of *laminata* is not known.

Male

1. Epiproct with a mesal hook (Figs. 43, 44 and 48).. *longa*
- Epiproct with one or two pairs of hooks (Figs. 42, 49 and 50)............................... 2
2. Epiproct with two pairs of hooks (Fig. 50) ....*quattuorhamulata*
- Epiproct with one pair of hooks (Figs. 42 and 49).. 3
3. Hooks of epiproct cylindrical (Fig. 42) .... *montana*
- Hooks of epiproct fan-shaped (Fig. 49) .... *bihamulata*

Female

1. Lateral margin of pronotum with a hump



Figs. 62–67. Epiprocts of male nymphs, posterior views — 62, *Scopura montana* sp. nov.; 63, *S. longa*; 64, *S. bihamulata* sp. nov.; 65, *S. quattuorhamulata* sp. nov.; 66–67, *S. laminata* sp. nov. from Chiri-san (66) and Odae-san (67). Scale, 0.5 mm.

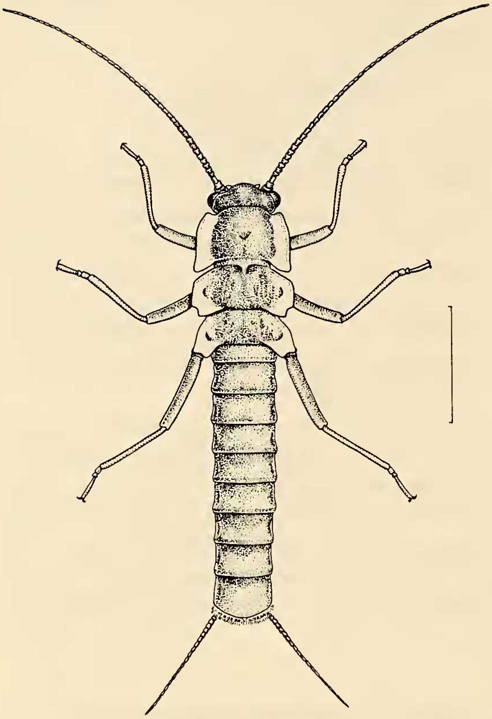


FIG. 68. *Scopura montana* Maruyama, sp. nov., female, habitus. Scale, 5 mm.

on anterior or median part (Figs. 14–17) 2
– Lateral margin of pronotum with a hump on posterior part (Figs. 18 and 19) 3
2. Lateral margin of pronotum with a longitudinally elongate hump on anterior part (Figs. 14 and 15) .... *montana*
– Lateral margin of pronotum with a transversely elongate hump on median part (Figs. 16 and 17) .... *longa*
3. Lateral margin of pronotum with a longitudinally elongate hump on posterior part (Fig. 18) .... *bihamulata*
– Lateral margin of pronotum with an oval hump on posterior end (Fig. 19) .... *quattuorhamulata*

Male nymph

1. Epiproct without knob nor swelling (Fig. 65) .... *quattuorhamulata*
– Epiproct with knob(s) or swellings (Figs. 62–64, 66 and 67) 2
2. Epiproct with a mesal knob (Fig. 63)... *longa*
– Epiproct with a pair of knobs or swellings (Figs. 62, 64, 66 and 67) 3
3. Epiproct with a pair of small knobs dorsally (Fig. 62) .... *montana*
– Epiproct with a pair of large swellings dorso-laterally or laterally (Figs. 64, 66 and 67) 4

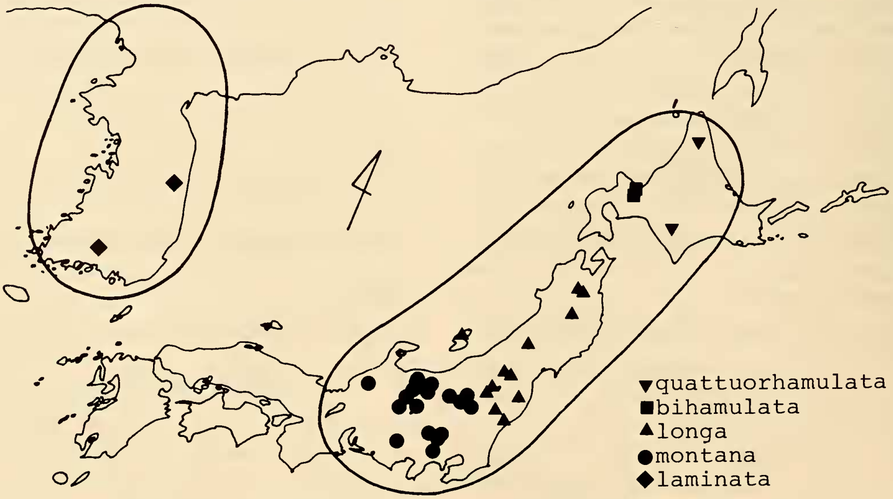


FIG. 69. Distribution of *Scopura* species. Solid lines represent the approximate distribution of the genus (from [8] and our material).

4. Swellings of epiproct sclerotized, produced dorsally, without produced sclerite between the swellings (Fig. 64).... *bihamulata*
- Swellings of epiproct membranous, produced posteriorly, with a mesal sclerite which is produced dorsally between the swellings (Figs. 66 and 67)............ *laminata*

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